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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
O. H. TITTMANN, SUPERINTENDENT

ALASKA

COAST PILOT NOTES

KUSKOKWIM BAY AND RIVER

MARCH 15, 1915



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DEPARTMENT OF COMMERCE,
UNITED STATES COAST AND GEODETIC SURVEY,
Washington, D. C., March 15, 1915.

This publication furnishes the available information relating to the navigation of Kuskokwim Bay and River from Cape Newenham northward, and is a part of a coast-pilot publication, now in preparation, which will cover the coast of Alaska westward and northward of Yakutat Bay.

It is based upon the surveys of the United States Coast and Geodetic Survey, including information furnished by the compiler, R. R. Lukens, who has served for three seasons on survey parties in this region.

This publication has been prepared under the direction of Herbert C. Graves, chief of the Coast Pilot Section, in the office of J. J. Gilbert, inspector of hydrography and topography.

Navigators are requested to notify the Superintendent of the United States Coast and Geodetic Survey of any errors or omissions they may find in this publication or of additional matter which they think should be inserted for the information of mariners.

O. H. TITTMANN,
Superintendent.

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NOTE.

The courses and bearings given in degrees are *true* reading clockwise from 0° at north to 360° , and are followed by the equivalent *magnetic* value in points in parentheses. General directions, such as northeastward, west-southwestward, etc., are magnetic.

Distances are in *nautical miles*, and may be converted approximately to statute miles by adding 15 per cent to the distances given.

Currents are expressed in knots, which are nautical miles per hour.

Except where otherwise stated, all depths are at *mean low water*.

KUSKOKWIM BAY AND RIVER,

from Cape Newenham to Bethel, are shown on charts 9103 and 9104, which are in preparation and are expected to be available for issue prior to April 15, 1915.

Cape Newenham is the landfall for this region, and can be approached close to with deep water. It is the end of a peninsula formed by a series of rough saw-tooth mountains. These mountains terminate in a level plateau which forms the immediate cape. In southerly weather a heavy sea and tide rips occur off Cape Newenham.

Jagged Mountain is a well-defined peak, the highest of the Cape Newenham group. Viewed from northward its slopes appear jagged.

Security Cove, 9 miles northeastward of Cape Newenham, is a good anchorage except with northwest winds; the usual summer gales are southeasterly. The bottom is even and shoals gradually. The best anchorage is about $\frac{3}{4}$ mile northeastward of Castle Rock, on the range of Castle Rock and the first rocky promontory southwestward, in $3\frac{1}{2}$ fathoms, mud bottom. Fresh water can be procured from a stream which enters the cove.

There is also good anchorage in the middle of the small bight on the southwest side of Castle Rock, in $3\frac{1}{2}$ fathoms, good holding ground. This anchorage is less affected by the ground swell making along the coast from Cape Newenham than the anchorage in Security Cove.

Castle Rock, the southwest point of Security Cove, is a small, prominent headland, 299 feet high, joined to the land by a low neck.

At the northeast point of Security Cove there is a conspicuous pinnacle rock, 169 feet high and covered with light tundra.

Chagvan Mountain is a smoothly shaped mountain terminating in two rounded knobs about 1,540 feet high, which lies between Security Cove and Chagvan Bay.

Chagvan Bay has a narrow shoal entrance. Inside it is very shoal and cut up by bars that are bare at low water.

Red Mountain is a conspicuous reddish-colored mountain just south of Goodnews Bay. From northward it appears as a long ridge with the highest part at its northern end.

Goodnews Bay is shoal except for the deep channel which leads through the entrance and for a distance of about 1 mile inside. This channel affords good anchorage, the best place for vessels being in the middle of the entrance; small craft can select a berth from the chart that affords the best shelter. The sea from outside is broken by the shoals off the entrance and does not reach the anchorage. With

southerly or easterly winds tide rips, dangerous for boats, occur in the channel. The spits at the entrance are of shingle and steep-to. Fresh water may be had from a small stream near Baluka Hill.

Shoals extend $2\frac{1}{2}$ miles off the entrance of Goodnews Bay. In 1914 the channel with best water led across the shoals from southward, and had two bars, with a least depth of about 10 feet, $2\frac{1}{2}$ and $3\frac{1}{2}$ miles southward of the entrance. The following directions led through the channel: Bring the inner shore of the north spit just open of the west shore of the south spit, and stand in on this range, course 17° true (**N $\frac{1}{4}$ W** mag.), until across the bars. Then follow the south spit at a distance of $\frac{1}{4}$ mile, and cross the entrance to a position 300 yards eastward of the north spit. A 56° true (**NE $\frac{3}{4}$ N** mag.) course with the south side of the north spit astern will then lead in the channel through the bay for a distance of over 1 mile.

Mumtrak is a small native village at the head of Goodnews Bay, and can be reached by small craft only, owing to the extensive mud flats. Two small creeks enter the bay, one on each side of the village. There is a Government school and a native trader at Mumtrak.

Baluka Hill is a prominent conical hill 886 feet high, with a steep, rocky face that rises abruptly from the north side of the bay. Although lower than the mountains behind it, Baluka Hill usually stands out prominently from all parts of Kuskokwim Bay.

Carter Spit is a low sand spit about $4\frac{1}{2}$ miles long and from 50 to 300 yards wide. It incloses Carter Bay which is a wide area of shoals and mud flats. Around the end of the sand spit there is a narrow channel scoured out, affording an anchorage for launches and small craft. There is no protection from northward. A small stream known as *Indian Creek* flows into the east side of Carter Bay near two abandoned cabins, formerly called *Carter*. Fresh water can be obtained by boats from Indian Creek at high water.

Explorer Mountain is the highest peak northward of Goodnews Bay. From southward it appears as a long ridge and is recognized by three deep gulleys on its side. From westward it appears as a pyramid peak, the highest of the group.

Tooth Mountain is a flat topped mountain in the front range, and has a sharp, rocky pinnacle on the northern edge of its summit. It is easily recognized from the vicinity of Carter Spit.

Figure IV Mountain is a sharp peak in the front range eastward of Jacksmith Bay. The deep ravines on the side of this mountain form a perfect IV which is conspicuous from westward when the ravines are filled with snow. In the latter part of the summer the snow disappears from the ravines.

Cone Mountain is a large conical mountain in the first range.

Yukon Hill is low, but is the north end of the front range paralleling the coast, and is visible from the entrance of Eek Channel.

From westward it is not distinguishable, as it has the receding range as a background.

Thumb Mountain is a fairly sharp summit in the range which recedes from Jacksmith Bay. From off Quinhagak it resembles a huge thumb placed on a high flat mountain plateau. As Eek Island is approached the mountain appears as a ridge and is not so distinctive.

Jacksmith Bay is the large indentation 14 miles northward of Carter. It is entirely bare at low tide.

Quinhagak P. O. is almost inaccessible by water because of the great mud flats bordering its shores. Launches can enter the creek here only at the highest tides, and even small craft can hardly get within sight of the village and remain afloat at low water. Supplies are landed with great difficulty, owing to the extensive flats and their exposure. There is a Moravian mission, store, and Government school, and a limited amount of supplies may be procured. The church steeple is sometimes visible from Eek Channel.

Warehouse Bluff is a long dark-colored bluff about 12 miles northwestward of Quinhagak. This is an important landmark as it is the first land on the east bank to be sighted when ascending Eek Channel. No objects on the west shore are visible until approaching the head of Eek Channel.

Warehouse Creek is a deep creek about 2 miles above Warehouse Bluff. It is approached through a long tortuous channel through the mud flats that can be followed by small craft when the flats are bare. Small craft may find shelter here. The greatest range of tide in the bay occurs in the vicinity of Warehouse Creek.

Kuskokwak Creek flows into the east side of the river about 4 miles southward of Beacon Point. It is approached through a short channel across the flats and affords a good shelter for launches and other small craft. There is a depth of 4 fathoms just inside the mouth of this creek.

Beacon Point is generally considered the mouth of the river. Two range beacons are built on this point. The rear one is a 30-foot square tower and the front one is a low tripod. They mark the cross-over from Eek Channel.

Popokamute is a large native summer village on the west bank at the mouth of the river just across from Beacon Point.

Eek Island is a grass-covered mud flat cut up by deep sloughs, and is covered by the higher tides. Eek Island affords a feeding ground for many thousands of ducks and geese.

West Point is the local name given the fishing camp on the west bank of the river just above Eek Island. The native pilot "Capt. John," lives near here, and "Moses" is often found at the fishing camp.

There are a number of small native villages on the river between West Point and Bethel.

Bethel is considered the head of ocean navigation. There are a Moravian mission, sawmill, and two or three stores located here. A river steamer is operated from Bethel to the headwaters of the river. At Bethel the Kuskokwim Commercial Co. has a large warehouse with rock-filled cribs to which large vessels can moor and discharge. The range of tide here is only about 3 feet, but the stage of the river has considerable influence on depths.

Bethel is the supply point for the lower Kuskokwim Valley. About 13 feet is the deepest draft that should attempt to reach Bethel, although a vessel drawing 14 feet has ascended the river to that point.

Mail facilities.—The mail for the lower Kuskokwim comes monthly by the way of the Yukon and Holy Cross Mission. It is transported over the portage to the Kuskokwim and carried down that river in small boats as far as Quinhagak. Power schooners from Seattle also carry mail when practicable.

Pilots.—There are two native pilots who know the river above Eek Island. They are known locally as "Moses" and "Capt. John." "Capt. John" lives on the west side of the river just above Eek Island, and "Moses" is usually found at his house on the east bank near the wrecked schooner *Volante*, abreast the upper end of Eek Island. On the appearance of a vessel, one of these natives usually puts off to engage himself as pilot. There is no established fee.

Currents.—The currents of Kuskokwim Bay and River are strong. A strong tidal current sweeps past Cape Newenham, setting approximately north and south true, and another follows the shore along the north side of the cape. In general the currents set in directions parallel to the axis of the channels between the shoals. In the deep channels off Jacksmith Bay the flood current has a velocity usually of about 2 to $2\frac{1}{2}$ knots at strength, and the ebb from $2\frac{1}{2}$ to 3 knots. In the vicinity of Eek Island, the strongest ebb current observed was $3\frac{1}{2}$ knots. Here the current turns from one to one and one-half hours after high and low waters. The flood current is felt only about as far as Bethel.

Ice.—The river is usually open for navigation about June 1, although ice conditions are uncertain and vary much from year to year. In the fall ice makes on the upper river in October, and heavy ice forms off Goodnews Bay in November. Goodnews Bay freezes over entirely in the winter.

Weather.—All reports agree that the best weather usually occurs in March and April of the early spring. During the summer southeast to southwest gales are frequent, lasting from two to five days. These storms gradually blow themselves out, and are generally followed by a few days of good weather. In the early fall northerly

winds are frequent, and are usually accompanied by a clear sky. After the middle of September strong gales become frequent and prolonged.

Fresh water can be obtained from small streams in Security Cove, in Goodnews Bay near Baluka Hill, and from Indian Creek in Carter Bay.

Tides.—In Kuskokwim Bay and River there are usually two unequal high waters and, to a much less extent, two unequal low waters during the lunar day, the inequality varying principally with the declination of the moon. About two days after the moon is on the equator the tides are generally nearly equal and have the least diurnal range. About two days after the moon reaches its greatest declination (farthest N. or S.) the tides are very unequal, and usually have the greatest range of the month; these are called "great tropic tides."

On account of the difficulty of determining accurately the tidal elements in this region, a special table of predicted times and heights of high and low waters for 1915 at Apokak is in preparation, and will be available for issue prior to April 15, 1915. The following table is intended for use with that table. The time of high and low water for any day will be found by subtracting the time difference given in the following table from the predicted times for that day at Apokak. The best determination of the height of high and low water will be found by multiplying the height of the particular tide for that day at Apokak by the ratio of ranges from the following table:

Station.	Range of tide.		Tidal differences and ratios referred to Apokak.			
	Mean.	Great tropic.	Time of—		Ratio of ranges.	
			H. W.	L. W.		
Goodnews Bay (South spit)..	Feet.	Feet.	H. m.	H. m.	Feet.	
Carter	6.2	9.8	-3 30	-4 35	0.66	
Quinhagak	8.0	11.6	-2 40	-3 40	0.85	
Warehouse Creek	¹ 9.7	¹ 13.2	-1 35	(¹)	¹ 1.03	
Apokak	10.0	13.5	-0 55	-1 05	1.06	
	9.4	12.9	0 00	0 00	1.00	

¹ At Quinhagak, the water never fell to the true datum of lower low, as there is apparently some obstruction between the position of the tide staff and the channel in the river. Theoretical ranges for this station are given.

DIRECTIONS, KUSKOKWIM BAY AND RIVER.

About 13 feet is the deepest draft that should attempt to reach Bethel, although a vessel drawing 14 feet has ascended the river to that point.

The navigation of Kuskokwim River and its approaches is difficult. In the bay the shoals are generally hard and steep to. In a southerly storm a heavy sea makes up the bay nearly to Eek Island, and vessels caught on a shoal are in danger of being pounded to pieces.

The lead is the navigator's best aid, and it should be kept going constantly on both sides of the vessel. No definite rules can be given for following the channels by the surface indications of the water. At certain times the channels will be smooth with rips on the shoals; but again for no apparent reason the indications may be reversed, with rips in the channel and a slick on the shoals. The edge of a channel is often marked by a long line of foam, although cases have been known where the line of foam extended across the channel. It is always well to approach such a line with caution.

Mariners are strongly cautioned against attempting to follow the channels in the bay at high water. Owing to the inequality of the tides, a vessel grounding at high water may not float again for several days. By waiting for low water the mud flats become natural aids instead of dangers.

Passing about 2 miles westward of Cape Newenham make good a 28° true (**N $\frac{3}{4}$ E** mag.) course for about 6 miles until the cape bears 190° true (**S $\frac{7}{8}$ E** mag.). Then make good a 10° true (**N $\frac{7}{8}$ W** mag.) course with Cape Newenham directly astern for about 18 miles until Baluka Hill bears 65° true (**NE** mag.) and Red Mountain 121° true (**E by S** mag.). From this position make good a 341° true (**NW $\frac{1}{2}$ N** mag.) course for about 13 miles to a position 4 miles 256° true (**SW by W** mag.) of the elbow of Carter Spit. About June 15, 1915, a beacon for survey purposes will be erected on the elbow of Carter Spit.

In thick or hazy weather a route nearer the coast may be taken as follows: Pass $\frac{1}{2}$ mile off Cape Newenham and Seal Rock, and then make good a 70° true (**NE $\frac{1}{2}$ E** mag.) course for about $6\frac{1}{2}$ miles until Castle Rock, the southwest headland of Security Cove, bears 177° true (**SSE** mag.). Strong tidal currents occur along the north shore of Cape Newenham. From this position make good a 357° true (**NNW** mag.) course with Castle Rock astern for 14 miles until the summit of Red Mountain is abeam. Then make good a 341° true (**NW $\frac{1}{2}$ N** mag.) course for $19\frac{1}{2}$ miles to a position 4 miles 256° true (**SW by W** mag.) of the elbow of Carter Spit.

From a position 4 miles 256° true (SW by W mag.) of the elbow of Carter Spit, make good a 302° true (W by N mag.) course for $5\frac{1}{2}$ miles with Baluka Hill in range with Pyramid Mountain astern. Then head up the channel on a 6° true (N by W $\frac{1}{4}$ W mag.) course.

Vessels should arrange to make this point at the last of the ebb tide, and go up the channel with the flood tide. After heading on the 6° true (N by W $\frac{1}{4}$ W mag.) course, the long shoal on the east side of the channel should be made out, either heaping or breaking. It is only with a very smooth sea that this shoal is not in evidence at low water. After continuing on this course for about 10 miles, the long shoal on the west side of the channel should be made out, either heaping or breaking. This shoal should be followed at a distance of about 1 mile until its northern extremity is reached. Here it becomes a flat, bare at about half tide. It is of a yellowish color and has deep water close to. This flat is the leading mark for entering Eek Channel, and therefore it should always be made at low water.

From here for about 15 miles the channel must be followed by the chart and the lead. The leads should be kept going on both sides of the vessel, as the slope at the sides of the channel is sufficient to make the difference in depth, obtained with the two leads, a warning of the approach to the flats. Near the edges of the channel the water usually shoals abruptly. In clear weather the white church steeple and buildings at Quinhagak may sometimes be seen from this channel.

Having arrived at a point in the channel from which Quinhagak bears about 99° true (E by N mag.), a black mud flat which is well bare at half tide should be made out ahead if the tide is not too high, and at the same time Warehouse Bluff should be picked up bearing about 37° true (N by E $\frac{1}{2}$ E mag.).

Pass about $\frac{1}{2}$ mile westward of this mud flat, and then follow the flats as indicated on the chart. This part of the channel is not difficult to follow at low water, but it is almost impossible to navigate it at high water when the flats are covered.

From the head of Eek Channel there are two channels which are used. The channel eastward of Eek Island is generally used, and there is a range on Beacon Point for entering it. The channel westward of Eek Island is considered somewhat easier than that eastward, provided the long flat on the west side at the head of Eek Channel shows above water. In case of a vessel grounding on a falling tide, masters are warned against using their engines too long, as the silty bottom is apt to be sluiced out from underneath the stern of the vessel with serious results when the tide falls completely.

To pass on the east side of Eek Island, favor the east side of the channel until on the Beacon Point range. This range has a 30-foot square tower for the rear mark, and a smaller tripod beacon for the front mark. Follow this range which leads in a least depth of about

12 feet at low water, and enter the deep channel which follows the east shore of the river above Beacon Point. Follow the shore at a distance of about $\frac{1}{4}$ mile, until off the slough which lies about 1 mile north of Apokak village. From this point head about 304° true (WNW $\frac{3}{4}$ W mag.) and enter the channel which extends along the north side of Eek Island. This crossover has a least depth of about 7 feet, and is a difficult one to make. A power boat should be sent ahead to sound, as the channel is narrow and is apt to shift from year to year. If possible, a native pilot should be employed before attempting the crossover from Apokak.

The channel along the north side of Eek Island is easily followed until its west end is approached, as the deepest water is close to the shore. Passing about 150 yards northward of the west point of the island, the channel trends about 295° true (W $\frac{1}{2}$ N mag.) to the west side of the river at West Point. Owing to its narrowness and danger of change, the channel near the west point of Eek Island should be navigated very carefully and with a small boat ahead sounding.

To pass on the west side of Eek Island.—This channel should not be attempted unless the mud flat on its west side at the head of Eek Channel is bare. Favor the west side of Eek Channel, round the head of the mud flat at a distance of about $\frac{1}{2}$ mile, and steer for the beacon at Popokamute until the deep channel near the western shore is entered. This leads over a bar with about 8 feet at low water.

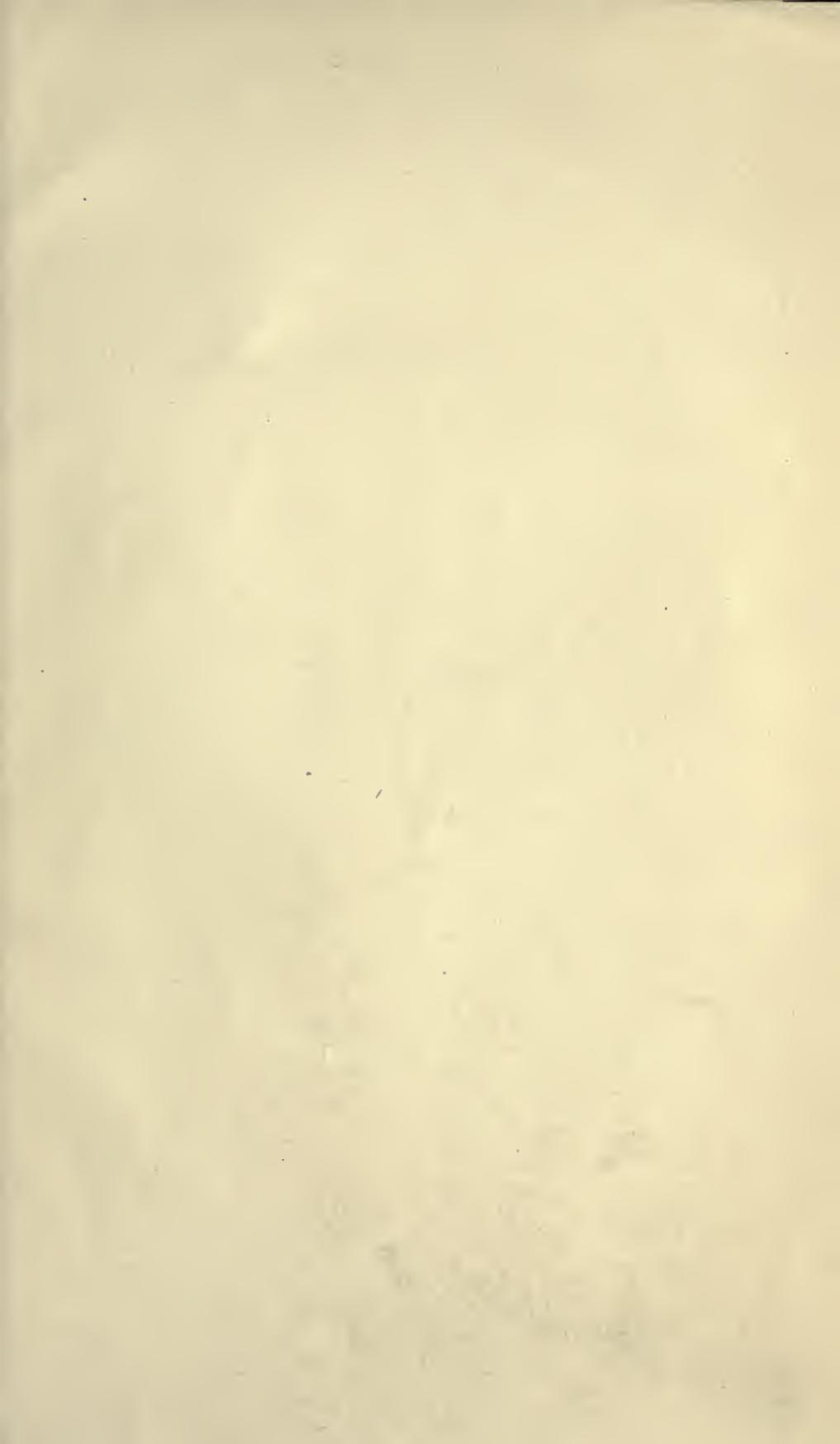
Owing to the incompleteness of the survey at this point, the uncertainty of the stage of tide, and the possibility of bars shifting, vessels are advised to send a power boat ahead to sound when making this crossover. Great care should be taken to avoid getting too far northward, as the shoal extending down from the south point of Eek Island is steep to. In places it drops from 1 fathom to 10 fathoms in a ship's length.

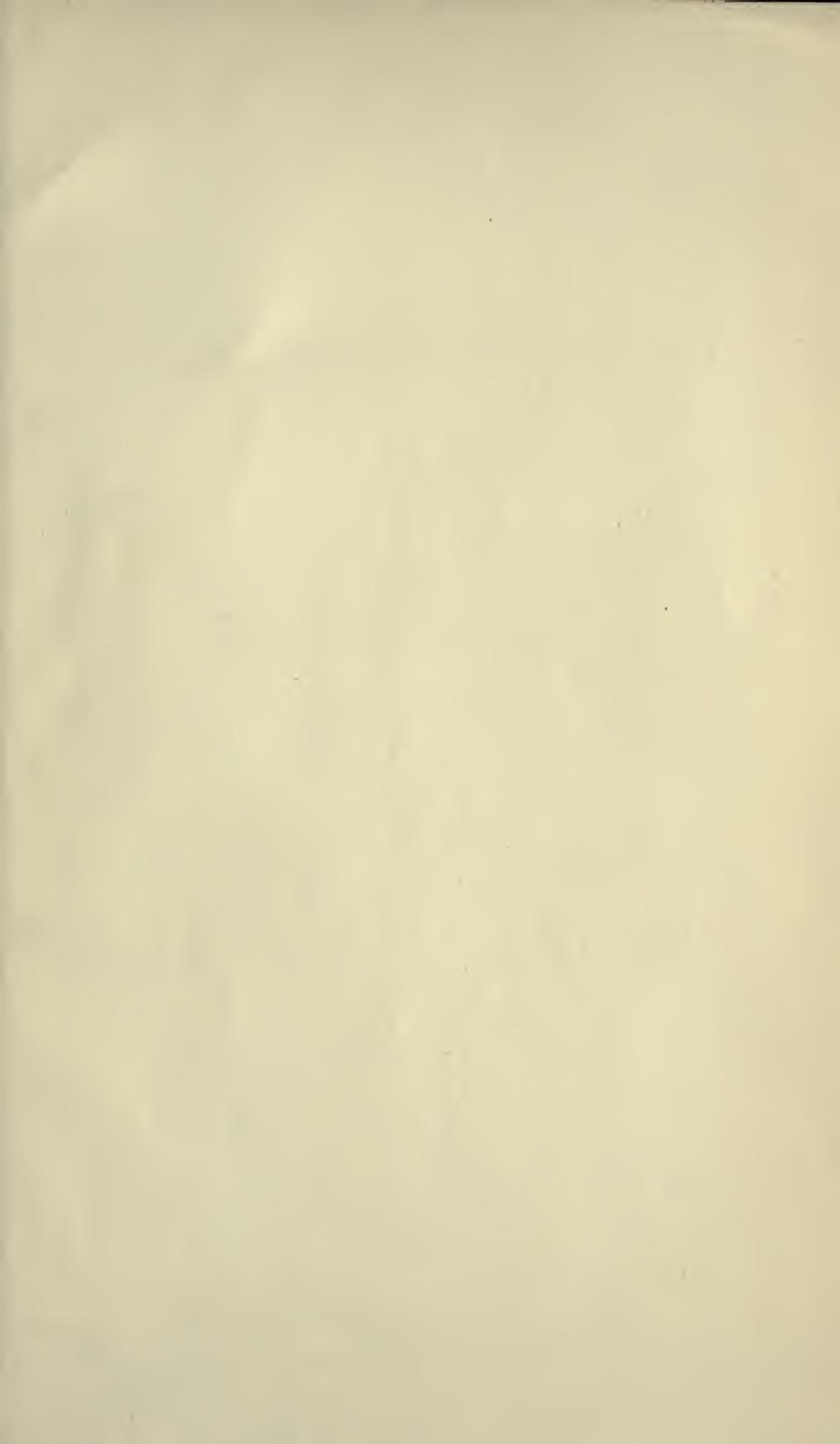
From Popokamute to West Point a deep channel follows the west bank of the river as shown on the chart.

Above West Point the river should not be attempted without local knowledge. The channel crosses from one side of the river to the other many times, and there are no prominent features which can be used as leading marks.

In August, 1914, the surveying steamer *Yukon* made a trip from Eek Island to Bethel. A least depth of 13 feet was had. This was found at about high water on the crossover about 2 miles south of Bethel.







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